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Patent Gas Exhauster.

We beg to call the attention of gas companies to a new patent rotary gas exhauster, of which the Atlantic Dock Iron Works are the exclusive manufacturers. The accompanying woodcuts will explain its operation and construction with the aid of a very short explanation.

It will be seen to be in general design similar to some other rotary exhausters, but with this important exception, that the number of working parts is not one half as great as in any other exhauster of the same class.

The first engraving is a perspective view, showing the general appearance of the exterior of the exhauster. Fig. 1 is a sectional end elevation, and Fig. 2 (on next page) a sectional side elevation, in which the whole of the details of the machine are shown.

The internal cylinder is connected to the shaft protecting through the head of the machine, and receives a rotary motion from the belt pulley. The three blades are carried round by the cylinder and moved in and out by the blocks on the ends of the blades, which run in grooves in the exterior cylinder head. These blocks are made adjustable so as to compensate for any wear either in the ends of the blades, the blocks themselves, or the grooves, and this is said to be absolutely the only wear that requires any adjustment, or that might be at all detrimental to the working of the exhauster. The operation of adjusting the blades (which will not require to be done oftener than once in two or three years) is the work of a very few moments. All that is necessary is simply to take off the blades shown in the engraving on the top side of the cylinder head, and set up the adjusting screws in the blocks. Whether this adjustment is made when required or not, the exhauster will go on working without injury, but with slightly increased slip.

The adjusting blocks are of steel, as are also the pins carrying the blades. The blades themselves are of cast iron, planed and scraped, and of sufficient thickness to prevent any spring when forcing at a high pressure, as is apt to be the case with wrought iron blades. The greatest care is taken in the construction of these exhausters, both as regards workmanship and design, all the parts being fitted with perfect accuracy, and ample wearing surface provided. They are guaranteed to run with less attention as long as any exhauster in use. A working model may be inspected at their office, 98 Liberty street, New York, or the exhauster in actual operation may be seen at their works, Wolcott, Dikeman and Ferris streets, South Brooklyn.

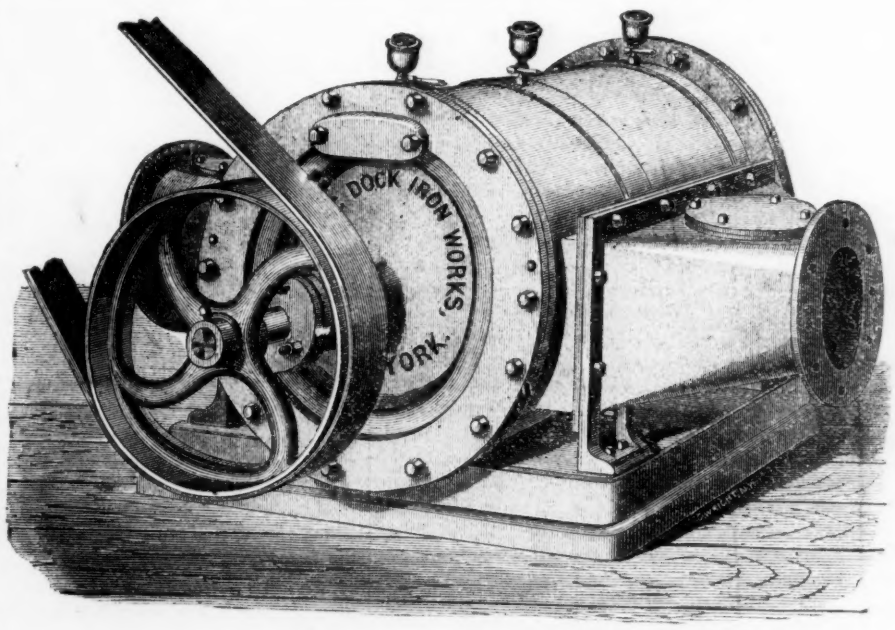
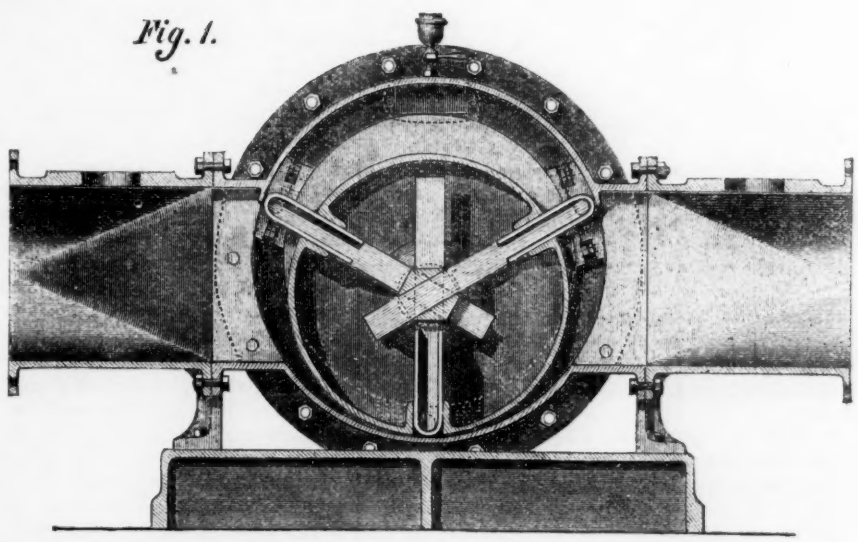
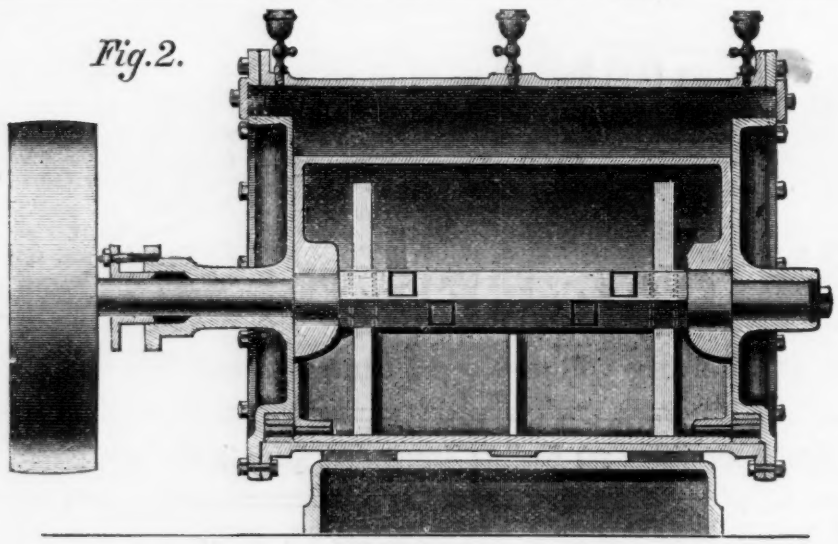


Fig. 1.



An Optical Delusion.—The following is an optical delusion, which is none the less interesting for being very easily explained. Let a person, standing before a looking glass, look attentively at the reflection of the pupil of one of his eyes, and then at that of the other—let him look at different parts of the eye, and from one eye to the other, first at one and then at the other. Knowing that thus, in changing the direction of his gaze, his eyes must move about in their sockets, he will expect to see that they do so in the glass. As a fact, they will appear perfectly still. If he looks at the eyes of another person trying the experiment, the peculiar fixedness of his own will be still more striking, when he looks at them again. I will not spoil the riddle by giving the answer at the end.—*Nature.*—*J. H.*

Fig.2.



Piping Oil to Pittsburgh.

A FORTY-MILE CONDUIT FOR PETROLEUM—MILLERSTOWN, BUTLER COUNTY, AND PITTSBURGH TO BE JOINED BY THREE-INCH TUBING.

During a recent brief conversation with Dr. Hostetter, President of the Columbia Conduit Company, or more strictly speaking, the Pittsburgh Pipe Company, we were put in possession of some interesting facts concerning that enterprise

This pipe line in its character and object certainly finds no parallel in the world, and when the powerful steam pumps along its course are set to work, pulsating the product of the oil regions over the intervening hills and valleys to this city, will become an extremely interesting and suggestive addition to unique enterprises, resultant upon the discovery of petroleum.

The points connected by this lengthy string of tubing are Millerstown, the head centre of the deep well region of Butler county, and Fairview station, on the West Pennsylvania railroad, about eight miles from the city. From the receiving tanks at the former place, connections of inch pipe ramify to the producing regions adjacent, and collect the oleaginous fluid in two tanks of 25,000 barrels capacity, and at Fairview, five immense tanks will be erected of 125,000 barrels capacity, from whence our refiners will be supplied by a pipe laid across the Allegheny river.

The route pursued by the line is unflinchingly direct, and in only one portion of the thirty-two miles does it deviate from absolute straitness. After leaving Fairview, the line passes in a N. N. E. direction through the townships of Indiana, Leasure and Fawn in this county, and through those of Clinton, Winfield, Clearfield, Jefferson and Donegal in Butler county.

The W. P. R. R. is crossed at a point one and a half miles S. E. of Saxton station, and this iron artery crosses no less than twenty-seven country roads, and about an equal number of streams. It has been decided not to bury the pipe except when roads are crossed, and where farmers so desire it when they are paid for their labor in placing it deep enough to be out of the way of the ploughshare. And so the pipe will be traceable along its whole course up steep hillsides, across level bottom land, through forest and field.

Inasmuch as Millerstown has been found to be 335 feet above the level of this city, the question arises, why should any provision be made for the transportation of the oil other than the inevitable result of gravity which causes water to run down hill, and why not fill the Millerstown tank, open the pipe, "and let her run?" But the friction of the fluid upon the interior of a pipe of that length would seriously interfere with that nice little plan, and to enable the Conduit Company to successfully attain their object, that is, the delivery of 4000 barrels of oil here each twenty-four hours, no less than six pair of fifty horse power steam pumps are placed at regular intervals along the line. These are so situated that but one is in operation at one time, the other being held in reserve in case of any accident. At each "relay" or pumping station a 1,500 barrel tank takes the oil for the purpose of delivering it to the fresh impetus imparted by the pump, and so it travels up and down with considerable velocity and in continuous throbs. The pumps are of the Blake and Cameron make, two of the most efficient in use. The steam cylinders are 24 by 30 inch, and the pumps are of the "direct acting" order, so well known in the oil regions, and whose hoarse coughing can be heard for miles.

Eight hundred tons of tubing are required for this line, of an internal diameter of three inches. The tubing is the product of the National Tube Works, McKeesport, and is now being laid at the rate of one mile per day. It is tested to the great pressure of 1,200 pounds per square inch, as the strain upon certain portions of the line will be immense. About thirteen miles of tubing have already been delivered, and by August 1st, it is expected a union of the two parties laying at either end will be effected. By September 1st the line is expected to be in operation.

The entire line will be guarded day and night by "walkers," and a telegraph line will give instant communication of every thing which transpires. The opening of this line of tubing to the oil regions, and its future, will be of interest to all our citizens.—*Pittsburgh Chronicle.*

Lead Pipe Manufacture in Cleveland, Ohio.

The Cleveland *Commercial Review* says: The steady expansion and growth of Cleveland in industrial enterprises is a source of supreme gratulation to its citizens, and a fact which the "outside world" does not fail to observe and duly appreciate. The peculiar advantages of this city as a location for manufacturing in nearly every department was never so fully realized and acknowledged as now, and the assurance that this is so is found in the circumstance that hardly a week passes without some new addition to this class of industry.

Among the most recent and important of these additions is the lead pipe works of Messrs. Gibson, Roberts & Beckwith. These works are located in the extensive building at the junction of Superior and Champlain streets, and are now in most successful operation. Mr. Samuel Gibson, the senior partner, is a gentleman of thorough experience in the business, having been actively identified with it for eighteen years, and having filled the responsible position of foreman in one of the most extensive establishments of the kind in the world. Under his direction the new works have been supplied with the best hydraulic machinery, and with all those appliances which are necessary to the production of the finest quality of work. A recent visit to the works gave us a view of the powerful machinery in operation, and revealed the mystery of the manufacturing of lead pipe of all sizes with astonishing rapidity and the most perfect precision. The works have a capacity for producing over seven tons of pipe per day, and the samples thus far made are pronounced by competent judges exceedingly perfect in finish and uniformity.

At an early day the proper machinery for rolling sheet lead will be added to the establishment. In the meantime the firm will, by dealers, offer their customers the best makes at the lowest prices. Mr. Fred A. Beckwith needs no introduction to this community. For years he has been intimately known to our business men of all classes as secretary and treasurer of the Wilson & Hughes Stone Company, and in other relations which he has ably and creditably filled. Mr. W. J. Roberts comes among us from Cincinnati, and will prove himself a valuable accession to the ranks of our young business men. This new firm will undoubtedly receive a cordial welcome from all interested in this branch of trade, and we take pleasure in recommending plumbers and dealers in lead pipe and sheet lead, not to fail to give this establishment an opportunity to supply their wants.

Underground London.

Underground the city of London is certainly the most wonderful in the world. It is a labyrinth of drain pipes, water pipes, gas pipes, and underground railways. There are points in the soil of London where it would be extremely difficult to find room for another pipe. One company alone—the Gas Light and Coke Company—supplies two districts with nearly four hundred miles of pipes, varying in diameter from three inches to four feet. These are the main pipes merely, and from them every house and street large receives on an average six or eight feet of small piping. In addition to these and the underground telegraph wires there are no less than 2500 miles of drain pipes of various dimensions. Less familiar to us, but not less important, are the lead and iron tubes—lead pipes with outer castings of iron—along which written messages, packed in little felt and gutta percha cases, are blown from station to station. The convenience of these messages is immense. A steam engine forces in a blast of air, and in about a minute it travels a distance of 980 yards. There are at present thirteen on the underground railway, and as the people walk upon the streets of London, electricity is flashing messages above their heads, and little missives are whizzing and darting just under their feet. As many as 1500 messages pass to and fro in a day.

The drainage system of London presents a system of underground streets some two or three thousand miles in extent. All the drains empty into the great sewers running parallel with the Thames, which sewers connect in the neighborhood of Victoria Park and through Barking Creek discharge into the river. Men are constantly employed keeping these drains in repair. Londoners never pour a pail of water down a drain, but at the depths of that mysterious aperture somebody is making way for it. A stranger, properly accouspanied can explore these depths, which resemble vaulted galleries, in the sides of which are traps forming various small channels. When the storm waters come, as they sometimes do during a thunder storm the torrent is fearful—so much so that upon several occasions men have lost their lives.—*Iron Age.*

American Sulphur.—One of the most remarkable deposits of native sulphur, as yet discovered, in a great hill composed of the almost pure article, found some two years ago at a distance of thirty miles south of the Union Pacific Railway and nine hundred miles west of Omaha. This marvelous deposit is found to consist almost wholly of sulphur, containg only 15 per cent of impurities. The best deposits heretofore available are those found in Sicily. The principal supplies for the manufacture of sulphuric acid come from there: the deposits contain 34 per cent. of sulphur. Our western sulphur hill, therefore, is much the most valuable, and promises to become ere long of great importance to the country.—*Scientific American.*

Chemical Repertory.

No. 120.—September 16, 1874.
EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

117. A Wonderful Gas Well in California.—We cannot forget, says the Colusa *Independent*, to make mention of the gas fire which issues from the mountain in close proximity to the Elgin mine. The side or a hill is all ablaze, and has been so for eight years, when fire was communicated, to the gas which emitted, by M. G. L. Eaton, and has been burning steadily ever since. This accrues enormously to the richness of the Elgin, as they can run their furnace with little or no expense. An escape is now taking place of 125 cubic feet, sufficient to run a dozen furnaces.

1228. Wet Boots.—The *Agriculturist* gives the following advice to farmers who, next to fishermen, are apt to get their boots wet through: "When the boots are taken off, fill them quite full with dry oats. This grain has a great fondness for damp, and will rapidly absorb the last vestige of it from the wet leather. As it takes up the moisture it swells and fills the boot with a tightly fitting last, keeping its form good, and drying the leather without hardening it. In the morning, shake out the oats and hang them in a bag near the fire to dry, ready for the next wet night, draw on the boots, and go happily about the day's work."

1230. Gas-Carbon in Voltaic Batteries.—A correspondent of the *Scientific American*, James Pool, recommends that in the Bunsen battery the carbon element should be supplemented by filling the porous cup around it with gas-carbon in powder, like gunpowder. He calls it "graphite," but says it comes "from the inside of the gas retorts." He claims a great increase thus in sustaining power of current, also that less nitric acid is required for charging, and hence less offensive fumes.

1231. Ancient Egyptians Put to Modern Uses.—The other day at Sakhara I saw nine camels pacing down from the mummy pits to the bank of a river laden with nets, in which were femora, tibia, and other bony bits of the human form, some two hundred weight in each net on each side of the camel. Among the pits there were people busily engaged in searching out, sifting, and sorting out the bones which almost crust the ground. On inquiry I learned that the cargoes with which the camels were laden would be sent to Alexandria, and thence be shipped to English manure manufacturers. They make excellent manure, I am told, particularly for Swedes and other turnips. The trade is brisk, and has been going on for years, and may go on for many more. It is a strange fate to preserve one's skeleton for thousands of years in order that there may be fine Southdowns and cheviots in a distant land! But Egypt is always a place of wonders.—*London Times.*

1162. Chemistry on the Stage.—The papers tell us that a new sensation is to be introduced on the stage. An actress fixes a dose of poison for her rival; then in a French fit of virtue and remorse, gulps the dose herself, directly has a pain, a worse one, a pang, a cramp, and finally convulsions, during which her face, neck and arms go through the changing hues of white to gray, gray to purple, and purple to black; when she very properly dies. This is accomplished by the application of some wash to the skin, and the turning on at the proper moment of some vapor or gas, which acts upon the chemical property of the cosmetic worn. The effect is startling and very sensational. A well-known actress from another theater fainted at the first performance of this death and its variegated complexion. It is not difficult to perform, however. The cosmetics contain bismuth or lead, and the floor or pillow upon which her head rests is sprinkled with a solution of sulphuretted hydrogen.—*Scientific Press.*

1233. Petroleum, with a Wick.—But a short time since we had an item about a wagon-load of *naphtha*, horse and all, furnishing amusement to the New York populace as a street-bonfire, the horse having been saved only in the last extremity. Naphtha burns without a wick; but it seems to have escaped notice that common wood makes a good wick for petroleum. But a few days since an oil train on the Erie Railroad furnished a fine example, and now we have the following again from Jersey city:

"A kerosene wagon owned by J. McGrandel, which was standing in Railroad avenue near Grove street, took fire yesterday afternoon at 5 o'clock, from sparks by a locomotfve of the Pennsylvania Railroad, and was entirely destroyed with the exception of the running gear. The body of the wagon was thoroughly soaked with oil and burned like tinder, causing quite a commotion in the vicinity."

1234. The Benzine-Fiend Abroad Again.—At 11 o'clock P. M., September 2, Mrs. Vincent Peters, residing at No. 32 Montgomery street, Jersey City, attempted to extinguish a kerosene oil lamp by blowing down the chimney, when the lamp exploded and the burning oil was scattered all over her clothing. Her agonized screams attracted the attention of the neighbors, and a number of them, headed by officer Harvey, rushed to her assistance. The officer seized a coverlet from the bed and throwing it around the woman succeeded in smothering the flames. Mrs. Peters was terribly burned about the face, head, and breast, and all the hair was burnt off her head. She was carried to Mercein's drug store, on the opposite side of the street, and Dr. McGill was immediately summoned. By his order she was taken back to her own apartments and placed in bed. The doctos dressed her wounds, although he was of the opinion that his services would not be of any avail except to alleviate her sufferings, as her injuries must necessarily prove fatal.

1235. Irrigation in India.—The Marquis of Salisbury, Secretary of State for India, has at length determined to fight the periodical famines which undo in one year the work of twonty. He is going to do this by means of a vast system of irrigation—so vast indeed that the figures in the estimated cost are startling. The government of India has always given much attention to this subject. Gigantic works have been undertaken, and many have been completed. Still much remains to be done: and the progress made, though great, has not kept pace with the increased demand for irrigation. Lord Salisbury's scheme is comprehensive enough, if thoroughly carried out, to insure all Northern India for all time to come against any failure of crops from a lack of water. The scheme has been submitted, and the estimated cost is 400,000,000 rupees ($200,000,000). In order to raise this immense sum of money, which, after all, is probably an under estimate, fresh loans will have to be made, and India is already burdened heavily with taxation. But if the country can be effectually preserved against another calamity such as has just visited us, the expenditure will be well invested.

1236. London Asphalt Paving.—For a year or two back a considerable part of the Lord Mayor's realm has been paved with asphalt, like the streets of Paris, or apparently like them, for under the severe heat which we had in the beginning and middle of July these smooth street floors have begun to show peculiarities unknown to those of Paris. If my reader will push forward his or her finger-ends on a table-cloth (pressing them against the table) the cloth will rise before the fingers in a sort of wave-crest. This is what has been happening all along the streets to which I refer. The asphalt pavements have proved a movable covering to the streets, and have rippled up in the most singular way before the wheels of the cabs, omnibuses, and other vehicles. Where one of those waves became piled up and packed the wheels have mounted over it and begun to plough until another was made, and so the busy streets are made of asphalt waves. It is a notable fact that, though Paris is far hotter than London, no such phenomenon has ever occurred with its beautiful, smooth streets, and the conclusion seems irresistible that the contractors to whom was intrusted the work of making the city streets similar to those of Paris, have been using some cheaper cement than that which French experience has shown to be necessary for the purpose.—*M. D. Conway, in Cincinnati Commercial correspondence.*

1237. A Fine Mill-Site.—Whether the water power of Niagara Falls will ever be fully utilized is a question that no one can now answer. The present generation has not done it, but judging by our progress beyond the achievements of our predecessors, there is no telling what posterity may be able to do. Some one has already humorously suggested that a huge water-wheel put up at Niagara might be made to turn a shaft passing "across the State of New York," by means of which power could be "let out." But the joke now may be to some extent a reality in the future. Could Niagara be utilized, its water power would far exceed all the other water power we now use. The last census shows that in 1870 there were 52,017 water wheels in use in American manufacturing establishments, which had an aggregate of 1,130,417 horse power. Yet at Niagara the power of that grand waterfall is ten times as much as this huge aggregate, for a correspondent of the Smithsonian Institute, who has investigated the subject, states that the Niagara water power is equivalent to 11,363,036 horse power.—*Philadelphia Ledger.*

1238. Another Wonder of Science.—In the following, the novelty seems to reside in the "ribbon of carbon." At least, it seems to us we have heard everything else before: A new and intensely white light has lately been invented and exhibited by Mr. William Day, of Ohio. A thin ribbon of carbon is suspended between two platinum poles and covered by a globe containing dry carbonic acid gas. The ribbon receives an electric current from a battery, and while in the atmosphere of the gas becomes brilliantly incandescent. The carbon is not consumed, and the light is said to be perfectly constant. The method was invented by Prof. Osborn, of Miami University, who at first thought it necessary to use very thin strips of carbon, but the light is now produced with much larger ribbons and with little if any combustion. The heat generated has never as yet broken the small glass globe containing the ribbon. This light being constant, and not requiring the combustion of carbon, may prove much more useful to scientific lecturers than the ordinary electric or oxyhydrogen lights, both of which are troublesome to handle.—*Ibid.*

1239. Preservation of Iron Ships.—The British Admiralty lately directed that unslaked lime be placed in boilers which could be kept empty, and in those cases where they were liable to leakage from the sea, by filling them with a solution of lime in sea water. The result of the experimental application of the solution of lime has been so satisfactory, that its use is to be extended to iron and composite ships under the circumstances described in the following circular, No. 36, of 1874, lately issued by the admiralty. "Experiments having shown that the destructive action of bilge water on the iron frames, etc., of iron and of composite vessels may be reduced or altogether obviated by the use of lime, my Lords Commissioners of the admiralty are pleased to direct that in all cases where it may be found impossible to dry out completely any of the compartments, bilges or wings, in order to coat them with composition, paint, or cement, as prescribed by circulars 28, of 1872, 22, of 1873, and 31, of 1874, lime well slaked is to be placed in the water contained in such places. As unslacked lime would injure coatings of composition, paint or cement, care is to be taken that the lime used is thoroughly slaked."

On the Condition of the Impurities in Coal Gases of High and Low Illuminating Power.

By Chas. R. C. Tichborne, Ph.D., F. C. S., etc.

In the years 1872 and '73 I had an opportunity of trying some experiments in connection with the condition of the impurities in gas of a high standard (20 candles). My first experiments were instituted to see how far carbon was actually disseminated through the atmosphere from those gases, or whether a 20-candle gas would, as described by Prof. Frankland, owe its higher illuminating power to the radiation of light from denser hydrocarbon vapors or from solid particles. This enquiry, after a time, developed, as will be seen, into one of another character; but I will first detail my preliminary researches.

It is probable that the main increase in the illuminating power of a gas is due to the causes specified by Prof. Frankland, but it is equally certain that, in practice, solid carbonaceous particles are more freely disseminated from the gas of a high standard than from a low one, say a 16-candle, the conditions being exactly similar as regards burner and supply of air. This fact may be determined in many ways. In one of my experiments four small chambers were constructed for the relative and optical examination of the atmospheres resulting from the combustion of these gases by the electric or lime light. Two chambers are required for the examination of one light; and the two experiments with the different gases under examination were simultaneously performed.

Filtered air was introduced into one of the chambers, in which the gas was burning from an ordinary fish-tail burner, and the products of combustion passed into the second, or dark chamber, through which passed a beam of bright light. It is very easy to arrange these compartments or chambers in such a manner that a comparative view of the results may be determined by the eye. The combustion of the gas must be regulated by watching the metres provided for the purpose of controlling the supply. It may be objected to such a mode of examination that the light impinging upon the clouds of heavy hydrocarbons would produce similar effects to solid carbon; but the carbon deposit can be virtually procured by placing cold plates of glass at stated distances over openings along the route of the escaping vapors. An arrangement was made by which cold water was allowed to flow at the back of the plates to keep them cool. These plates will reveal a slight deposit of carbon when examined by the electric or lime light, and from the relative examinations so effected by them, and the previous experiments, there could be little doubt that the high illuminating gas gave a greater deposit, *cæteris paribus*.

These experiments, however, were not followed up, because they gave no pronounced information. The results were not quantitative, and were only confirmatory, to a certain extent, of what our general observations have premised, viz., that 20-candle gas, as made practically in gas retorts, will deposit carbonaceous matter more fully than 16-candle gas. This question, however, is outside the question of illuminating intensity, and is an accidental but an accompanying fact. From my experiments, I am of opinion that coal gas of the lowest standard, possessing any amount of luminosity worth mentioning, will show traces of this deposit when submitted to searching tests.

My attention was attracted, in the winter of the year 1872, to the marked effect of the combustion-products of gas on some fabrics dyed with aniline colors, and from certain indications then perceived the following investigations were instituted:

I determined to investigate the products of combustion from different gases possessing different illuminating powers, chemically and quantitatively—the gases to be burnt in as nearly as possible the same condition as we should use them in our ordinary consumption. And as in these experiments my object was to obtain extreme gases, or gases which would present extreme phases as regards their condition, I arranged to have two in use, one of a low illuminating power, obtained by passing the ordinary gas at my disposal through a given volume of spirit. The gas played through the spirit in a specially arranged vessel, and the results were remarkably uniform if the amount of spirit was regulated with each measure of gas. The spirit was found to be strongly impregnated with the hydrocarbons, and was rejected after each experiment. At the exit of the wash-bottle was arranged a short condensing apparatus of a simple nature, intended to eliminate as much as possible all liquids from the experimental gas. Even the spirit itself is, to a certain extent, found floating onwards, due to the attraction of liquids by miscible vapors. My gas with the high illuminating power was obtained by substituting the light petroleum hydrocarbons (boiling from 25° to 30° C.) for the spirit in the washing apparatus, using the same amount, and rejecting after each experiment as before.

From the slowness of the combustion, and the necessary complications of the apparatus, it was quite impossible in such experiments to determine the actual illuminating power of the actual gas performing the experiments; but when I say that the gas used in one set of experiments marked on an average 12 to 12½ candle gas, and that the carbonised gas marked on an average 21 candles, I think there is little question but that there was margin enough to allow of any slight fluctuations there might be in this respect in the original gas with which I was manipulating.

The experiments were put on at the same hour, and all performed under as like a condition of circumstances as possible. The gas, when burned in Letheby's apparatus, gave 0·41 gr. of sulphur for each 10 feet, and may be considered as a fair specimen of commercial gas.

The photometer used in these experiments was Bunsen's, with Letheby's modifications. Each observation was made with ten readings taken at minute intervals, and the average formed the determination.

From the unmistakable evidence of sulphurous anhydride ("sulphurous acid") found in a given sample of gas of a high illuminating power, determinations were instituted with regard to this substance, or rather, we should say, the condition of oxidation in which the sulphur molecule would be given off. It is hardly necessary to say that sulphur rarely passes to the burner as sulphide of hydrogen; if the gas makers know their business, it is chiefly as sulphide of carbon that it exerts its deleterious influence. Let it be understood, however, that it is immaterial whether the sulphur is present as sulphide of hydrogen or sulphide of carbon; the products will be SO_2 or SO_3, sulphurous or sulphuric anhydride, according to the perfection of the combustion. The first action of heat upon bisulphide of carbon is to resolve it into its elements, carbon and sulphur, which are burnt, respectively, into carbonic acid and sulphurous anhydride, according to the following equation:

$$CS_2 + 6O = CO_2 + 2SO_2$$

Therefore we may consider that the combustion of bisulphide of carbon in coal gas is tantamount to the combustion of sulphur itself. It is generally stated that the result of the combustion of sulphur in atmospheric air or oxygen is sulphurous acid; but this is only partially right—in fact, in experiments performed for the purpose I always find that a trace of sulphuric acid is formed, and that much more is formed in the presence of a large supply of oxygen, or in the presence of the lower oxides of nitrogen, which it will be seen further on may probably occur in coal-gas.

Sulphuretted hydrogen burns very easily, and the combustion is generally attended with the production of free sulphur if there is an imperfect access of air, or if the gas is eliminated in large volumes; but such a decomposition is hardly likely to occur in coal-gas.

The experiments were performed in Letheby's apparatus for the estimation of sulphur in gas. It was very convenient to apply the chemical examination intended to the products of combustion, and the object was not so much the estimation of the sulphur as to get a qualitative examination of the products of combustion. In these experiments 15 to 30 (generally 20) feet of gas were allowed to pass through the metre at the rate of 1½ hours to each foot of gas. The carbonising or decarbonising apparatus (as the case might be) was placed between the meter and the burner, and the products of combustion were mixed with vapor of ammonia, and, by a bent glass chimney, were conveyed into the ordinary large glass cylindrical receiver. In the preliminary experiments, the ammoniacal vapor, used to fix the volatile acid, was introduced just below the burner, with the intention that it should be drawn through the apparatus by the strong draught produced by the combustion. It will be seen that another arrangement had to be adopted, owing to an unforeseen reaction. Two fluid ounces of distilled water were introduced into the receiver to assist and determine the condensation of volatile products, and the whole was supplemented by a very long tube, which condensed and brought back into the cylinder all the combustible products. The total amount of the sulphur in the gas averaged 4·16 grains per 100 feet, determined by precipitating the products with chlorate of barium ($Ba_2\,ClO_3$) in a hot solution.

Having estimated the total sulphur, the object we had in view was now to estimate the amount of sulphur eliminated from the burner as SO_2, and for this purpose a volumetric solution of iodine was used, each 100 c.c. of which represented 0·2 grain of sulphur or 0·4 grain of sulphurous anhydride.

The first experiments were performed with an argand burner, the ammonia being introduced into the centre of the flame by a tube; hardly any evidence of sulphites could be found in the receiver, owing to the production of lower oxides of nitrogen. An ordinary fishtail burner was at this stage of the investigation substituted for the argand burner, and the following were the results with a 21-candle gas:

1. (10 feet) required 7 c.c. vol. sol. I.
2. (20 ") " 8 " "
3. (30 ") " 10 " "

When the products of combustion were acidulated with sulphuric acid previous to the estimation with the volumetric solution, indications were still there of the lower oxides of nitrogen, and, from the discordant results, it was self-evident that there was some cause of error. In fact, the diffusion of the ammoniacal gas was so rapid that part of its vapor was burnt at the expense of the flame under experiment. To remedy this, the ammoniacal gas was so arranged that it should enter the large glass cylinder just where the bent chimney conveying the products entered, so that the cylinder was always full of ammoniacal vapor, but there should not be any in the chimney, the draught being so strong that all the vapors are swept forward through the apparatus with some considerable impetus.

After this arrangement was effected, the experiments proceeded with considerable regularity as will be observed from the following figures:

30 feet required 35·5 c.c vol. sol. I.
30 " " 32·6 " "
30 " " 36·0 " "

showing an average of 11·5 c.c. of the volumetric solution of iodine as being neutralised by the products of combustion of 10 feet. This represents 0·023 of a grain of sulphur eliminated as sulphurous acid to the 100 feet.

The experiments were repeated, but the gas was decarbonised by passing it through the measured quantity of methylated spirit as detailed. At the conclusion of the experiments, the gas was found saturated with volatile hydrocarbons of the benzole series, and small quantities of hydrocarbons having a high boiling point.

20 feet required 9·0 c.c. vol. sol. I.
20 " " 8·0 " "
20 " " 11·5 " "

Average of this gas, therefore, calculated to the 100 feet, only gave ·0095 grain of sulphur as given off in the form of sulphurous acid to each 10 feet.

To sum up these experiments as far as they have gone, we may state that one of the most important observations made consists in the fact that in a gas of a high illuminating power a very large proportion of the sulphur is eliminated as sulphurous acid, that in one of a low illuminating power a considerable portion will be eliminated as sulphuric acid. Another important phase of the combustion is that the ammo-

ia, or such volatile compounds as aniline (if they ex st in coal gas), will be converted into nitrous acid or ome of the other low oxides of nitrogen.

The products of the slow combustion of ammonia would seem to be nitrite of ammonia; and ammoniacal gas and oxygen, according to K. Kraut, is entirely converted into that gas by a spiral of platinum wire. It is also probable that some bisulphide of carbon is retained by some of the fluid used in these experiments. This might account for the low amount of sulphur found in the relative experiments, but not for the great discrepancy in the two series of estimations.

As regards the relative therapeutical effects of sulphuric *versus* sulphurous acids, it might be said that the ultimate results would be the same because the sulphurous acid becomes gradually converted into the higher oxide. This is only true to a very limited extent; in fact, the sulphuric acid vapors are much more local in their effects, whilst the sulphurous acid is diffused at once through the apartment, and may be perceived, by virtue of its irritating effects upon the lungs, in any part of the room. It is probable that in the storage of delicate goods they would be much more likely to be injured by the sulphurous acid, and, *ergo*, by the 20-candle gas, than from the emanations of 16-candle gas. I am of opinion, also, that there is more sulphide of carbon present in ordinary gas than is generally stated, and that it escapes all the ordinary processess of estimation. I must, however, reserve this point for another communication.

As regards the Letheby apparatus, it seems capable of performing many experiments having an important and useful bearing. Its great recommendation is that it submits the gas to a combustion similar to that which takes place in its daily use, and that, if more perfect combustion of the sulphur took place upon burning the gas with spongy platinum, as in Valentine's process,* it would not give the information we require in these special investigations.

The experiments embodied in this paper are not put forward as by any means complete, but they may be viewed as pioneers of a style of investigating which must be attended with some novel results, and must repay the experimenter. The presence of ammonia in the gas will determine the elimination of the sulphur as sulphuric acid.—*Chemical News.*

A Few Observations on Coal.

By E. W. Binney, V. P., F. R. S., F. G. S.

Of late years much has been written on the structure of coal, and the various vegetable remains of which it is composed. Observers examining different coals under the microscope have, as might be expected, come to different conclusions. Some of them have found little else than the remains of spores and spore cases, others only scalariform and cellular tissues and a few spores, and a third class little trace of any structure whatever in the specimens they examined. Splint or hard coal would generally afford the results first named, soft caking or cherry coals the second, and cannel coals the third.

Soft coals, yielding a large amount of charcoal enclosed in bright coal, nearly always show plenty of structure in the "mother coal." as well as a few macrospores in the bright portions. Macrospores are nearly always found in abundance in splint and hard coals. In cannel coals they are sometimes found as well as the cellular and scalariform portions of plants.

For many years macrospores were known by the names of spore cases and spores. They could be easily observed by the naked eye in the black parts of the coal, and they were generally considered as sporangia; but Prof. Adolphe Brongniart in 1868 described a cone (*Lepidostrobus Dabadianus*) having sporangia full of very minute spores, in fact microspores, in the upper portion, and sporangia full of macrospores, which had been so long known, in the lower part. These observations of Brongniart have been amply confirmed by specimens from the British coal fields.

Thirty years ago it was considered that the soft or cherry coals were chiefly composed of the remains of large plants such as *Sigillaria*, *Lepidodendron*, etc., while caking coals were formed of plants of a lesser size and much bark, for it had been observed, and since confirmed, that the outsides of *Sigillaria* and other fossil trees, sometimes reaching to two or three inches in thickness, were chiefly composed of bright soft coal, showing little traces of structure.

In the great law suit which was tried at Edinburgh more than twenty years since as to the nature of Boghead coal, much evidence was given as to its structure, some witnesses finding in it scarcely anything else than the remains of vegetables, whilst others found only a stray portion of scalariform structure or a macrospore. Both Boghead and the other brown cannels of Scotland are now generally considered to afford but little evidence of vegetable tissues under the microscope, although numerous remains of *Sigillaria* and other common coal plants can be seen by the naked eye in them. Notwithstanding that they are so rich in volatile matter, and far exceeding other coals in their yield of paraffine and paraffine oils, they contain from 25 to 30 per cent of mineral matter in the form of ash. This circumstance has induced certain scientific men to class them as shales rather than coals, notwithstanding that they have the specific gravity of coals.

Some years since, when describing several fossil cones affording both kinds of spores, he expressed an opinion that the yellow matter seen in the vesicles of Boghead coal was nothing but microspores composed of paraffine or a similar hydrocarbon, and that they were driven off by heat in the form of a yellow vapor, leaving nothing behind but a spongy mass of earthy and carbonaceous matter. The evidence that caused him to come to this conclusion was that the microspores contained in the upper sporangia of *Lepidostrobus Harcourtii* had all the appearance of crude paraffine, and were of the same yellowish brown color as powdered Boghead coal, and that the latter substance was composed nearly altogether of microspores and mineral matter. So far as his observations extended, microspores had not been observed in coal, although plenty of macrospores, which are generally 1-20th to 1-25th of an inch in diameter, and easily seen by the naked eye, had long been noticed.

He had some time since directed his friend, Mr. J. W. Kirby, of the Pirnie Coal Company, to examine the Fifeshire seams of coal in search of microspores, most of those beds yielding macrospores in great abundance, and that gentleman had lately furnished him with the specimens now exhibited, both splint and soft coals, but especially the former, affording the two kinds of spores. On burning the yellow coal composed of macrospores, a most brilliant flame and a peculiar empyreumatic odor like that from burning Boghead coal were produced, whilst the splint coal full of macrospores only burnt and smelt like ordinary hard coal, thus clearly showing that these two kinds of spores differed very much in their inflammable properties and odors given off, and that such properties were certainly not due to the larger spores, but most probably to the smaller ones.

The compressed lenticular bodies in the splint coal were formerly of oval and spherical forms with a triradiate ridge on one half, and although their exterior was composed of a brown coriaceous substance, their interior was full of white carbonate of lime, or bisulphide of iron, according to the nature of the matrix in which they were found; thus suggesting the idea of their having been filled with granules of starch when in a living state, which it is probable they would have been in case of their being germinating spores.

He and his late partners at Bathgate, when manufacturing paraffine oil there, had tried various means, by subjecting Boghead coal to the action of ethers and naphthas, to dissolve out paraffine from it, but they had never succeeded; so the yellow matter in the coal may probably be changed into paraffine by the heat employed in distillation. Dr. Schorlemmer, F.R.S., who has been so kind as to examine the microspores found in the Muiredge splint coal, is of opinion that they are not composed of paraffin, but some other hydrocarbon. This may, therefore, change into paraffine by the application of heat in a similar way to what the yellow matter in Boghead caal does.

The macrospores are about 320 times the size of the microspores and constituted the germinating spores, while the microspores were the fertilizing agents, both having been contained in one cone.

Several specimens of fine bright soft coal, between two and three inches in thickness, taken from the outsides of *Sigillaria* and other fossil trees, were exhibited. In these there was no appearance of charcoal, spores, or vegetable structure, and in every respect they resembled the black shining parts of soft cherry and caking coals, which generally afford no distinct traces of vegetable structure. Hence from his observations he was led to conclude that soft or cherry coal was chiefly composed of the bark, cellular tissue, and vascular cylinders of coal plants, with some macrospores and microspores.

That caking coal had much the same composition, except that it contained a greater proportion of bark in it.

That splint coal had a nearly similar composition, but with a great excess of macrospores.

That cannel coal, especially that yielding a brown streak, was formed of the remains of different portions of plants with a great excess of microspores, which had long been macerated in water.

These conclusions were arrived at merely as to the composition of the different kinds of coal. No doubt each seam would be materially affected by the nature of the roof, whether the latter was an open sandstone or a close and air-tight black shale or blue bind, for the former would allow the free escape of gaseous matter, and the latter would prevent its escape. It is well known that the character of the roof has a deal to do with the quality of the coal under it.

* The method for estimating the total amount of sulphur.

Electro-Chemical Examination of the Action of Soft Water on Lead.

The subject of the action of soft water on lead has recently much occupied the attention of the Academy of Science at Paris. The following presents a summary of the last and most important results laid before the Academy, as extracted from the *Comptes Rendus:*

MM. Mayençon and Bergeret state that sulphuretted hydrogen is not a sufficiently exact test to discover the presence of lead in solution. It has hitherto been considered as the test most to be relied on. They have found, however, that sulphide of lead formed. on adding the test, is slightly soluble in water saturated with sulphuretted hydrogen, and also in many natural soft waters. If water containing a salt of lead be treated with an excess of sulphuretted hydrogen, and then filtered, all the lead does not remain on the filtering paper, for the liquid that has passed terough still contains some of the metal. This is readily proved by having recourse to an electric current, for the negative pole—say a platinum wire—immersed in such a solution undergoing electrotysis will speedily have a deposit of metallic lead on its surface. The presence of the lead is proved in the following manner: The platinum wire is exposed for some seconds to the action of gaseous chlorine; the lead, if any be on its surface, is at once converted into the chloride. This is then placed on a piece of filtering paper, moistened with a very dilute solution of iodide of potassium. Immediately a trace is afforded of the yellow iodide of lead. This result may be verified in the following way: The platinum wire, from which only a portion of the lead has been removed as chloride, is to be rubbed on a piece of common white paper, and this is to be exposed to sulphuretted hydrogen gas, when a brown tint will be at once seen. All the results that the experimenters obtained were thus doubly verified. By many trials they became assured, having had constantly the same results, that, first, neither the artificial nor natural (*galena*) sulphide of lead were insoluble: and, second, that sulphuretted hydrogen, while precipitating a large amount of the lead as sulphide, still leaves sufficient in solution to be easily determined.

During the course of their investigations they employed a variety of solutions for the purpose of obtaining conducting liquids for use in electrotysis, such as sal-ammoniac, caustic soda, and sulphuric acid (said to be pure), but they found that all these contained traces of lead, which invalidated their experiments. They eventually employed a solution of crystallizable acetic acid, which was free from that metal.

They tried repeated experiments on the action of the waters of the Loire, Rhone, and Saone on lead, and in each case the electrolytic method showed that a portion of lead had been dissolved. The result proved that the metal was soluble even in such water as contained both carbonate and sulphate of lime (hitherto considered as preventing the chance of the lead being dissolved). Their experiments were repeated with the same results in water artificially char

ged with those salts of lime. Various waters used for domestic purposes at Paris afforded the same effects.

Their general conclusions are as follows: 1, that sulphide of lead is soluble in soft water, and also in sulphuretted hydrogen: 2, that sulphuretted hydrogen is not a reliable test for minute portions of lead in solution: 3, that soft river waters, more or less holding carbonate and sulphate of lime in solution, dissolve lead: as, 4, do also those liquies artificially prepared to imitate them: 5, that the water of St. Etienne, supplied to public and private establishments, etc., contains lead in solution: but, 6, that the quantity so dissolved is too small to affect the public health, as has been proved in the hospitals, schools, and other places in Paris and its suburbs supplied with that water. They have not yet satisfied themselves, however, as to how far lead may affect or enter into, physiologically, the digestive organs of the human system—a matter which they propose to further inquire into. *London Journal of Gas-Lighting.*

British Gas-Cookery.

From the *Journal of the Society of Arts* we extract a paragraph read before several gentlemen invited by "The Inventors Institute," at the rooms of the "Royal Society of Literature," on the economic use of gas in cooking, by Mr. Southby, illustrating a patent gas-cooking apparatus, the joint production of his brother and himself.

A row of three small sized burners is placed in a chimney or box, open at both ends, thus bringing in a strong current of air. The small side of the jets admits of the richest gas being burned with safety, and without unpleasant vapors. A dripping-pan is next placed near the burners, with a small movable gridiron or stand on which the viands are placed over both burners and pan. A semi-circular cover is then put on, leaving however an escape at the sides for the air; thus, while compelling the hot air to pass over the surface of the meat, the objectionable taste of the oven is destroyed.

The sides of the chimney form a perfect brattice between the upward and downward currents of air, an important advantage over even the most recent improvements. The invention has certainly the merit of simplicity, and from experiments detailed at the time, appears to be thorough and efficient in working. With a No. 1 stove, a sirloin of beef weighing 12 lbs. was well cooked in 1 hour 55 minutes with but 7½ feet of gas; another weighing 7 lbs. was cooked at the cost of ½d. only. With the same sized apparatus, but furnished with a double or jacketed cover, a leg of Welsh mutton weighing 5 lbs. raw, was done to a turn, with but one small burner, using 2½ feet per hour. Meat, of course, loses much less than before an open fire, and is also less liable to char. Thus, with this stove results were much more certain, while from its simplicity servants could easily manage it, and great economy in cooking would follow its general adoption. The chairman inviting the gentlemen to express their opinion of the merits of the stove, Mr. Bartlett, a chemist, testified in very encouraging terms to its excellent performances: pastry also could be satisfactorily cooked by it. After a few further remarks from some present, the meeting closed with the usual vote to the chairman.

Asphalte Pavements in London.

A report by Mr. Haywood, the engineer to the commissioners, on the condition of asphaltic pavements in the city, has recently been published by order of the commissioners of sewers. This report embodies the results of Mr. Haywood's inspections up to April last. In order to obtain sufficient data for the examination, portions of many of the pavements were cut out, in order to ascertain whether they had lost materially in thickness. In nearly all cases some such diminution was proved to have taken place, but the conclusion arrived at was that it would not be possible to ascertain the exact loss in any case without making a considerable number of openings. When first laid the same thickness was never exactly pursued throughout, and in the case of those laid in the shape of heated powder considerable depression takes place. On the whole, there was no doubt that the asphalte had somewhat diminished in thickness under the wear of the traffic.

On the subject of the repairs executed, it was not easy to obtain accurate returns, the companies being bound to maintain the pavements in repair for a certain number of years. The results of the investigations are given in a tabular form. From this it appears that there are now altogether twenty-five streets or portions of streets, in the city, of which the carriage-ways have been paved with asphalte; one of the pavements had been down for 3 years and 9 months, two for two years and 2 months, eighteen under 2 years, four under 1 year, and five under 6 months, at the time of the inspection.

In nineteen places the Val de Travers asphalte—compressed—is laid, and amongst them are the two oldest specimens, that in Threadneedle street, which was laid as a specimen by the asphalte company free of charge, and that in the Poultry and Cheapside; the former has now been down 4 years (3 years and nine months in April), and the latter 2½ years. The older portion is in good condition, but the newer is beginning to require extensive repairs. On the other pavements the report is generally favorable as to the surface condition. Val de Travers—mastic—has been down two years in George-yard and is in good condition.

Mourotier—compressed—and Societe Francaise des Asphaltes-compressed-have each been laid in Princes street under a year. Both are in good condition, but the latter does not seem to have been well laid.

Limmer—mastic—has been laid in three places, Lombard street, Moorgate street, and Cornhill. This shows considerable wear, especially in Cornhill and Lombard street; in Moorgate street the surface is generally good. This has been down from one to two years.

Barnett's asphalte—mastic—is down in four places, Moorgate street, Carter lane, Lothbury, and Bishopsgate street. That in Moorgate street has been in use a year and a-half, and has been much repaired; the others for short periods only. Some of this is good, the rest is reported on unfavorably.

Maestu—compressed blocks—Trinidad—compressed and Patent British—mastic—were laid down, but afterwards removed and replaced by Val de Travers compressed—*Jour. Soc. Arts.*

Coal Statistics of Ohio.

The coal area of Ohio is estimated at 10,000 square miles—6,400,000 acres—and the aggregate thickness of the available coal is twenty feet. The coals of Ohio are especially valuable in being easily reached in seams of convenient thickness for mining, and in being in proximity to large beds of iron ore.

The following is the section of the coal measures as given by Prof. Newberry, the state geologist:

UPPER COAL MEASURES.

Strata	Feet.
Limestone	7
Sandstone	40
Coal No. 13	1 to 6
Sandstone and shale	70
Coal No. 12	1 to 6
Sandstone and shale	20 to 40
Coal No. 11	1½ to 4
Fire clay	1
Sandstone and shale	50
Limestone	6
Sandstone	45
Coal No. 10	3 to 6
Fire clay	3
Sandstone	35 to 40
Coal No. 9	2½
Fire clay	½
Limestone	30 to 70
Black shale	2 to 10
Coal No. 8	4 to 8

BARREN MEASURES.

Fire clay	3
Limestone	4 to 30
Shale and sandstone	110
Shale	5 to 10
Crinoidal limestone	2 to 8
Shale	1 to 17
Coal No. 7*b*	½ to 4
Fire clay	2
Shale and sandstone	50 to 100
Shale	2 to 10
Coal No. 7*a*	1 to 6
Fire clay	1
Sandstone and shale	50
Coal No. 7	0 to 5
Fire clay	3
Limestone	2 to 10

LOWER COAL MEASURES.

Mahoning sandstone	30 to 80
Gray shale	5 to 20
Coal No. 6	4 to 7
Fire clay	3
Limestone	0 to 8
Shale	50
Coal No. 5	2 to 4
Fire clay	4
Shale and sandstone	20 to 60
Gray limestone	3 to 6
Coal No. 4	2 to 6
Fire clay	3
Shale and sandstone	20
Coal No. 3*a*	2 to 3
Fire clay	3
Shale and sandstone	10 to 50
Blue and ferriferous limestone	4
Coal No. 3	2 to 4
Fire clay	6 to 12
Shale and sandstone	75
Coal No. 2	1 to 6
Shale	20
Sandstone	20 to 70
Shale	5 to 40
Coal No 1	4
Fire clay	3
Shale	0 to 20
Conglomerate	0 to 100
Waverly	

In these measures there are about ten beds of coal workable thickness.—*Engineering and Mining Journal.*

Gems from the Newspapers.

Cincinnati washes down its pickled trichinæ with coffee delicately tinted with blue vitriol.

The Equity Gas Company, proposing to manufacture gas from crude petroleum at $2 per 1000 feet, have determined to lay pipes in the Eastern district of Brooklyn.

A wealthy up-town resident of this city forbids the use of gas in any part of the house, except the kitchens. The rest of the house is lighted with wax candles,

[Very "nobby" indeed; but there is a limit to that sort of beatitude. Read the last word bee-attitude.—Ed.]

A sentimental exchange compares a shadow to false friends, "because it follows you only in sunshine." Which is exceedingly unjust to the shadow, for that faithful servitor follows us by lamplight as well, or even in the feeble glimmer of the Manhattan Company's gas.

[The Editor of this Journal, in a series of extremely careful and accurate tests of the gas of the company here referred to, has recently found it to average, during three weeks, *sixteen candles*. If the *World*, from which we clip the above, calls this a "feeble glimmer," what would it have? We say only; may its shadow (that of the gas, not of the *World*) never be less.—Ed.]

Malam's Gas Apparatus.

This gentleman described to the West of Scotland Association of Gas Managers, his plans.

It is claimed for this method of carbonising that by its means from 3,000 to 4,000 feet of gas extra per ton of coal can be obtained without any deterioration in illuminating power, whereby ten per cent. of addi-

nal dividend would be available. It was also stated that Mr. Malam, in his works at Dumfries, was able, by applying the new apparatus, to reduce the number of his retorts from 22 to 14; that a saving of 396 tons of coal had been effected in ten months by this means; and that the price of gas in Dumfries had been reduced 2s. 4d, per 1,000 feet.

In the course of the discussion which followed, an opinion was expressed that in some of the houses in Dumfries the light was very dull; but the reason of this was, not that the gas was bad, but that suitable burners were not used. Mr. Young pointed out that the larger the burner the larger the consumption; but it seemed to him that if larger burners were now needed than before, the gas was now inferior and more of it must be consumed to give the same light. He had several doubts in his mind, caused by thinking on the subject theoretically—doubts that seemed strengthened by this explanation of the burners; and while he knew that practice often proved different from what theories often led them to expect, he would still like to be convinced that this plan was all it was represented to be. Mr. Malam stated that four towns in Ireland had adopted his patent, and one in England; that 13,400 feet could be taken from a ton Newcastle coal, and that the illuminating power would then be seventeen candles; the waste was just the same from leakage as with the old plan.—*Iron.*

A Phosphorescent Mine.

The *Enterprise*, of Virginia City, Nevada, of a recent date, prints the following: About 1 o'clock yesterday morning, some of the residents of the western part of the city were startled by seeing what seemed a column of flame, 50 or 60 feet in height, shooting up out of a shaft near the old Ophir works. It was at first thought that the old timbers of the mine were on fire, and three or four men ran to the spot to see what could be done toward smothering the flames. On reaching the shaft, however, they found that there was no smell of smoke, and also that the supposed fire was a light unlike anything they had ever before seen, from its weird whiteness and the strange corruscations of its component particles. In the light the faces of the men wore a corpse like pallor. Two or three of those present were miners, returning from work, with dinner-pails in their hands, and it was observed that the pails (tin) appeared to be of a brilliant steel-blue color. Their clothing and hair also partook in some degree of the same ghastly and unnatural color, The light came up the full size of the large square shaft, and seen at a distance, as it rose through the falling snow, closely resembled one of the shooting spires seen in the aurora borealis, and it seemed to have something of the same waving and inconsistent motion.

Although the men felt creeping over them a sort of superstitious awe, they still had sufficient courage to approach the shaft and gaze into it. A strange sight was there seen. The whole interior of the shaft seemed to be at a white heat and glowed like a furnace. The timbers on the sides were particularly brilliant, and each splinter, excrescence or bit of fungus seemed dazzling rays that streamed steadily out in all directions. A warm, steamy current of air steadily ascended from the sweltering regions below, and there was observed a sickening, musty smell. All those who looked into the shaft afterward felt a severe pain in the temples, and two or three were made sick at the stomach. This singular appearance lasted nearly half an hour after it was first observed, and before it was all over eight or ten men, mostly miners returning from their work at various mines (it being about the time of changing shifts) had collected about the shaft. The light died out from the top downward, and protuberances from the sides of the shaft continued to glow for some minutes after the light was no longer visible above the top of the shaft. The light would seem to have been caused by the belching forth of some kind of highly phosphoreted gas from some of the deep, underground chambers in the old abandoned works. The rush of gas—for gas of some kind it must have been—was probably caused by an extensive cave in some place where the old timbers had rotted away. One of the men who had the good fortune to witness the strange phenomenon is of the opinion that the mixing or mingling of the gas from the mine with the atmospheric air had something to do with intensifying the light, as he observed in the ascending current of pseudo flame myriads of small particles of some small substance, globules of vapor, or something of the kind, which appeared to flash and scintillate as they darted upwards, and which presented in the general column of light much the same appearance as motes moving about in a sunbeam.

Coal-Washing in Pennsylvania.

The Broad Top is not essentially a very impure coal, but being divided by numerous very thin knife edges of slate, along which the sulphur present is deposited, the work of eliminating it became a more difficult problem. This problem has been solved by the machine in use at the Kemble Company's works, which crushes the coal as fine as rice and by making use of the difference in the specific gravities of coal and slate succeeds in producing an apparently absolute separation of the carbon from all the attendant impurities. The coke made is as handsome as the writer ever saw, and certainly not surpassed by the best Connellsville. It is strong, porous, resonant, a fine steel gray in color, and the result of several months use of it by the Kemble Company speaks volumes in its praise. The product of the company's furnaces had previously been largely made up of white and mottled iron, but since the coke came into use, the quality of the metal made from precisely the same ores has risen to the higher grades. The week I was there the furnace in blast was producing No. 1 extra, and the manager informed me that the product was about equally divided between foundry and the best grey forge. The iron was claimed to be strictly neutral, working equally well, hot or cold, and horse shoes and horse shoe nails made from it were triumphantly exhibited.

The increased cost of washing the coal was stated to be not more than fifty to sixty cents per ton, while the increased value of the metal made was between five and six dollars.—*Correspondence American Manufacturer.*

In regard to the height which travellers are able to attain, Alexander Von Humboldt, in his ascent of Chimborazo, was compelled to stop at a height of 16,000 feet, at which point he had to give up from suffocation; but in late years the brothers Schlagintweit ascended the Himalayas, and slept all night in bivouac at a height of 19.200 feet, and later ascended the peak Ibi Gamin, 22,000 feet high. The English astronomer, Mr. Glaisher, claims that he has ascended to a height of 26,000 feet without feeling any discomfort, and that only when reaching 32,000 feet he experienced any very serious feeling of suffocation.

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☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.

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American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 23 West st., Boston..... 11
Agency for the Gibson Improvement—W H. Grenelle, 42 Pine street, N. Y..... 10
Cast Iron Gas and Water Pipe—S. Decatur Smith, York and Meyer streets, Phila., Pa..... 8
Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa..... 10
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, Burlington, N. J.. 8
Franklin Foundry and Pipe Works—Jas. Marshall & Co., 23 Nineteenth street, Pittsburgh, Pa.. 2
Gas Valves (Chapman) 75 and 77 Kilby St, Boston, Mass... 3
Gas-Burners—C. Gefrorer, 259 Commerce st., Phil'a Pa..... 9
Gas Purification—St. John and Cartwright..... 5
Gaylord Iron and Pipe Company—90 and 92 Broadway, Cincinnati, Ohio..... 9
Gas Meters, etc.—Harris, Griffin & Co., 12th and Brown streets, Phila., Pa..... 10
Gas Meters, etc.—Wm. W. Goodwin & Company, 1012 Filbert street, Phila, Pa..... 11
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa..... 11
Gasometers, Etc.—Geo. Stacey & Co., Cincinnati, O..... 5
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway.. 7
Gasholders, Etc.—Deily & Fowler, 39 Laurel st., Phila., Pa.. 2
Gas and Water Pipes—B. S. Benson & Son, 68 B'way., N Y 5
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia..... 2
Gas Screens—American Gas Screen Manufacturing Co., Haverhill, Mass..... 4
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J.... 8
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Lava Tips and Scotch Tips—Charles H. Meyer & Co., 227 Chestnut street, Phil. Pa..... 8
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Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y..... 4
Patent Gas Exhauster—Smith & Sayre, 95 Liberty sttreet.. 4

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Gas Coals—Bird, Perkins & Job, 27 South st., N. Y..... 7
Monongahela Gas Coal—56 Exchange Place, Baltimore, Md. 6
New York and Cleveland Gas Coal Company—384 Penn Avenue, Pittsburgh, Pa..... 6
Ohio Gas Cannel—G. Merryweather, Pine cor. Wm. sts., New York..... 3
Peytona Cannel Coal—S. E. Low, 58 Broadway, N. Y..... 5
Red Bank Mining Company—Bird, Perkins & Job, 27 South st., N Y..... 7
Sterling Coal—Freeman Butts, Cleveland, Ohio..... 6
The Newburg Orrel Coal Co.—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7.. 6
Tyrconnell Gas Coal—52 S. Gay Street, Baltimore, Md..... 6

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Philadelphia Fire Brick Works, Vine and 23d sts., Phila.... 8
Retorts, Etc.—Geo. C. Hicks & Co., Baltimore Md..... 8

LAMPS, STOVES, PETROLEUM, ETC.

Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal..... 9

MISCELLANEOUS.

Analysis and Testing of Gas Coals—Prof. Henry Wurtz, 12 Hudson Torrace, Hoboken, N. J. 10
Architect and General Gas Engineer—William Farmer, 111 Broadway Room 95..... 5
American Gas Works Construction and Supply Company—61 Broadway, N. Y..... 3
Cements—S. L. Merchant & Company, 76 South st., N. Y... 7
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind..... 2
Gas Engineer—B. E. Chollar, 914 Olive St., St. Louis, Mo... 8
Gear Wheels—Scott, 98 Chambers St., N. Y..... 5
Gas-Light Company of America, 63 and 64 Drexel Building, New York..... 2
Fodell's System of Bookeeping—A. M. Callender & Co., 42 Pine st., New York..... 10
Massachusetts Institute of Technology—Samuel Kneeland Boston, Mass..... 3
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School of Mines, Columbia College, East 49th st..... 9
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Scientific and Practical Chemist and Geologist—Professor Henry Wurtz, 12 Hudson Terrace, N. J..... 2
Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y..... 2
West End Supply Company—Chas. H. Brown, 25, 27 and 29 North 20th street, Phila, Pa..... 1

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WEDNESDAY, SEPTEMBER 16, 1874.

WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of these subjects a pleasure, or a profession.

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CONTENTS.

☞ An asterisk (*) denotes an illustrated article.

*Patent Gas Exhauster.....101
Piping Oil to Pittsburgh.....102
Lead Pipe Manufacture in Cleveland, Ohio.....102
Underground London.....102
American Sulphur.....102
Chemical Excerpts.....103
On the Condition of the Impurities in Coal Gases of High and Low Illuminating Power.....104
A Few Observations on Coal.....105
Electro-Chemicol Examination of the Action of Soft Water on Lead.....105
British Gas Cookery.....106
Asphalt Pavements in London.....106
Coal Statistics of Ohio.....106
Gems from the Newspapers.....106
Malam's Gas Apparatus.....106
A Phosphorescent Mine.....107
Coal Washing in Pennsylvania.....107
EDITORIAL—
The Gas-Light Association of the United States.....108
The French Gas-Light Association.....108
Sunday Work.....108
Education in Gas Science.....108
The Exhibition of the American Institute.....109
The Servant Girl Question.....109
The Effect of Heat on Textile Fabrics.....110
Coal Measures in England.....110

THE GAS-LIGHT ASSOCIATION OF THE UNITED STATES.

The time for the third semi-annual meeting of this Continental Association draws nigh, and the official announcement has been transmitted to us, to which we of course give in this issue of the Journal, the place of honor.

The American Gas-Light Association covers a wider territory and a more widely distributed body of constituents, than any other existing association of members of the gas profession. We look for results therefrom, to be realized in the fulness of time, commensurate in greatness and import with the broad expanse of Earth's surface over which its sway extends.

CIRCULAR.

OFFICE OF SECRETARY AND TREASURER,
DETROIT, MICHIGAN.

The Second Annual meeting of this Association will be held in the Director's Room of the Academy of Music, Montague Street, in the City of Brooklyn, on the third Wednesday, the 21st of October, 1874, at 10 o'clock A. M.

The officers for the ensuing year are to be elected, and a revision of the constitution on the subjects of membership, organization, etc., will also be submitted for adoption.

Papers upon Purification, Coal, Leakage, Sunday-Labor and Naphtha Gas will be prepared and read by gentlemen conversant with those subjects; papers upon other interesting topics, by Professor Wurtz of New York, and Professor Douglas of Michigan University, may also be expected.

It is earnestly desired that a full attendance of members may be had at this meeting. Those contemplating membership, and the fraternity generally, are cordially invited to attend.

The annual dues of members, and of those wishing to join the Association, may be remitted to the Treasurer, or paid to him during the session of the Association.

P. E. DE MILL,
Secretary and Treasurer.

[EDITORIAL NOTE.—The Editor feels constrained to state that—while appreciating highly the honor of the mention of his name that he finds in the Circular—he nevertheless is not aware of any positive engagement, such as seems here implied, to address the Association; but, should it be the expressed wish of that body to hear him, he will be prepared, with great gratification, to bring forward certain matter of current interest to the profession.—ED.]

THE FRENCH GAS LIGHT ASSOCIATION.

It is our good fortune to have just received the first publication of the "*Societe Technique de L'Industrie du Gaz, en France*," a pamphlet of 38 pages, dated June, 1874; the meeting having taken place on the 23d of that month, under the Presidency of Monsieur A. Mallet, of Paris. The members of the Committee of organization were as follows:

A. Mallet, President, of Paris.
Emile Vautier, Vice President, of Lyons.
Albert Ellisen, of Paris, } Secretaries.
and Ed. Servier of Paris. }
Ch. Foucart, Treasurer.
E. Coze, of Rheims.
de Crapone, of Lyons.
A. G. da Costa, of Bordeaux.
P. Hugon, of Paris.
S. Jordan, of Paris and Marseilles.
Eugene Lebon, of Paris.
Leonce Vee, of Paris.

The President made a very impressive address, which if time will admit we may present in translation. M. Edouard Servier, one of the engineers of the Paris Gas Company, made an extended communication upon "Different Questions of Interest in Gas Industry." Among inventions of American origin we observe that mention is made by this gentleman only of that of Rowland. M. Rouget of Brest, made an elaborate communication on a Gas Meter of Constant Level. A constitution and by-laws were adopted, which are included in the pamphlet. This new organization, which numbers at the start no less than 84 members whose names are appended, we welcome with acclamation to the brotherhood of science.

SUNDAY WORK.

Space and time failed in the last two issues for comment on the interesting communication of Mr. Forstall, of New Orleans, a month since, on this subject. The topic is one, moreover, of which we have heretofore been somewhat shy; for the questions involved may not be conceded by all to come within our proper scope We ourselves have nevertheless become convinced that it is our duty to declare that—apart from all considerations of religion or conscience—the arguments drawn from considerations of humanity, consistency with the common law and social customs of all our American communities, and even from the grand consideration of expediency, are so cogent, that we find them resistless. This Journal, therefore, does not hesitate in announcing and pronouncing itself, in the earnest agitation of this question, which we trust is approaching in this country, to be in favor of introducing strict Sabbath observance into all gas works, so far as possible. We shall leave the question an open one as to the propriety of "sermonizing" in these columns, but shall certainly hereafter discuss this topic in all social, economical and even moral points of view, that may present themselves.

EDUCATION IN GAS-SCIENCE.

In connection with this subject, which was treated of editorially in our last issue, we cannot withstand the impulse to present some words from a recent article in *Nature*, the writer of which, referring to the practical achievements of that great American inventor and discoverer, Count Rumford, says:

"The main interest of the career of this wonderful man appears to me to lie in this, that it affords a magnificent demonstration of the practical value of scientific training, and the methodical application of scientific processes to the business of life. I have long maintained that every father who is able and willing to qualify his son to attain a high degree of success, either as a man of business, a soldier, a sailor, a lawyer, a statesman, or in any responsible department of life, should primarily place him in a laboratory, where he will not merely learn the elements of science, but be well-trained in carrying out original physical research, such training being the best of all known means of affording that discipline of the intellectual powers upon which all practical success depends."

These views have a peculiar applicability to the gas profession, and to the epoch upon which we are now rapidly entering.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

This great fair, which forms so important a feature—during its annual period of continuance—among the attractions of the Metropolis, both to our own people and the strangers within our gates is just now opened and getting fairly under way. We have not yet had the pleasure of a visit, but soon hope to have the same.

The present exhibition, however, we are assured, will not fall behind any previous ones in fulness and interest. The present is the forty-third annual fair. Among the seven departments into which the articles on exhibition are divided, the fourth department, that of Chemistry and Mineralogy and the fifth, that of Engines and Machinery, are those which will naturally most interest our readers.

Gas apparatus comes under the fourth department; the "departmental committee" having charge of which is composed of Chas. Wager Hull and Wm. E. Gavit (both well known). Mr. Hull is also the energetic and invaluable General Superintendent of the Exhibition. On Engines and Machinery the committee is made up of Messrs. Walter Shriver and Robert Weir.

The approaching great meeting of our National Gas-Light Association in Brooklyn, will furnish an opportunity for all the members of the gas profession to visit the great fair, on the Third avenue between Sixty-third and Sixty-fourth streets.

THE SERVANT GIRL QUESTION.

The cry of long-suffering humanity is going up again throughout the land. The mis-called "mistresses" of American households, upon whom rest the burden and responsibility of maintaining that compound of quiet, order, comfort and cheerfulness, which should make up a civilized home, and which only can compensate "menkind" for the struggles and defeats, the disappointments and discouragements of the life of the outer world—are again raising their voices and appealing for some amendment of the existing conditions, which subject them to lives of constant anxiety, contention and bitterness, and in numerous cases, actually render the maintenance of a happy home a thing beyond ordinary human capability.

The appeal is, just now—on both sides of the Atlantic—for the institution or introduction into social life, of a new element, namely, the special training of young women, who are destined to be the mothers of the people, in the arts and sciences which lie, or rather should lie, at the foundation of an enlightened domestic economy. This is a movement which must go on. The time is ripe for its prosecution, and when the blessings which will follow from it begin to be realized and comprehended by the general public, this will quickly be recognized as a field of exertion for the true reformer and philanthropist, whose harvest of blessings to mankind will be *greater than any other whatever.*

Strict moral and religious reforms should include, and even be preceded by this one; inasmuch as even the Christian religion, and it may be added, all systems of society whatever based on morality, have as their necessary fundamental doctrine the family tie. All that promotes the perfection of this bond between man, wife, and children, and conduces to the happiness, the unity and reality of HOME, brings us nearer to that millenial state of things, which is, theoretically, the aim of Religion and Morality.

Now, what is the prevalent reason why the servant question has, for a generation past, overshadowed, certainly with the female sex, all other subjects of discussion, has given rise to more home troubles, dissensions, ruin of temper and health, and despair, than almost any other of Satan's devices? We cannot hesitate to reply that it is a general incapacity—and this incapacity chiefly from ignorance—on the part of those who are called on to encounter the difficulty. There has been too much striving after mere showy accomplishments on the part of our daughters. The *utile* has been almost altogether sacrificed to the *dulce*. We must combine the two in future. It is not sufficient merely to admit the propriety and the necessity of this. We must make these things *fashionable*. It must come to be understood that there is beauty, even aesthetic beauty, in the useful arts of the household, when rightly viewed and correctly carried out, as well as in music and dancing. It must come to be considered a matter of duty and a matter of pride to any young woman who aspires—as they all naturally must—to possess a home of her own, that she is thoroughly familiar with the nature, composition, origin, and properties, chemical and physical, of all the materials that go to the support of a household and are consumed therein—that she shall, so far from disdaining, deem it a merit and a boast, that she can, if she chooses, cook a beefsteak, and serve it up in artistic style and teach her daughter and her servant, if need be, so to do.

Space fails for such a topic as this. We can only add, as we have said before, that it is one which touches us very closely. "Heating, lighting, and domestic economy," we put on our title page, and these comprehend no small part of the science of home.

Science of Home, this is a phrase which we hope to live to hear, as a household word. We have before shown that much of the servile labor which must now be sought after, and which involves so much curdling of the milk of human kindness, will be dispensed with, even at a saving of money, when gas-heating and gas-cookery come in, as they are fast coming.

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The Effect of Heat on Textile Fabrics.

Recent experiments on disinfection by means of heat, made by Dr. Ransom, of Nottingham, England, show that white wool, cotton, linen, silk, and paper may be heated to 250° F, for three hours without apparent injury, although the wool will show a faint change in color, especially when new. The same may be said of dyed wools and printed cottons, and most dyed silks; but one kind of white silk easily turns brown by this heat, and pink silks of some kinds are also faded by it. The same temperature will, if continued for a longer period, slightly change the color of white wool, cotton, silk, paper, and unbleached linen, but will not otherwise injure them. A heat of 295° F, continued for about three hours, more decidedly singes white wool, and less so unbleached cotton, and white silk, white paper, and linen, both unbleached and white, but does not materially injure their appearance. The same heat, continued for about five hours, singes and injures the appearance of white wool and cotton, unbleached linen, white silk and paper, some colored fabrics of wool, or mixed wool and cotton, or mixed wool and silk. It is noteworthy that the singeing of any fabric depends not alone upon the heat used, but also on the time during which it is exposed.

In these experiments the heat was obtained by burning gas with smokeless flames, and conducting the products of combustion, mixed with the heated air, by means of a short horizontal flue, into a cubical chamber through an aperture in its floor, and out of it by a smaller aperture in its roof. Fixed thermometers showed the temperature of the entering and outgoing currents, which represented the maximum and minimum temperature of the chamber. A self-acting mercurial regulator maintained the temperature of the entering current at any required degree.—*Boston Journal of Chemistry.*

Coal Measures in England.—The greatest solicitude is still exhibited on all hands to ascertain the position of the unworked coal measures, if any there still be in Great Britain. The great question concerns the coal measures supposed to underlie the southern counties of England. The coal field of Westphalia can be traced as far as Boulogne; it then goes under the Wealden formation, near Battle. It should run under Highgate near London, and under Swindon on its way to reappear as the great coal field of Wales. A deep boring, to ascertain if these deductions are true, has been some time in progress near Battle. The bore is being made with Beaumont's diamond drill and the cores preserved, and the hole has reached a depth of 1,030 feet. The Kimmeridge clay, supposed to be 300, has proved to be 800 feet thick, and the borer is now in the Oxford clay. In another 100 feet it is expected to reach the Oolite, which is believed to be thin and under which the coal measures should lie and are expected. The work has been supported purely by subscription, and the funds are now exhausted. Great hopes are entertained by English geologists of its ultimate success, which, if it proves real, will add incalculably to the coal resources of the country.—*Prof. Lesley's Journal.*

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Caledonia—At Mines, $2 00, Gold			0 00
Little Glace Bay—At Mines, 1 87½, Gold			2 00
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" Reserve Mine			2 25
" International			— —

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Westmoreland—At Amboy	7 00	@	0 00

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Youghiogheny	7 75	@	0 00
West Virginia Coals.			
MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00
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Ritchie Mineral of West Virginia	18 00	at Bait'e.	
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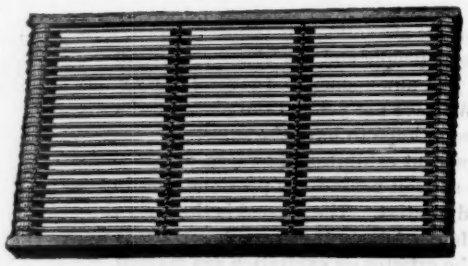

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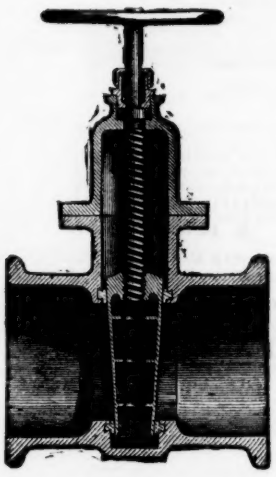


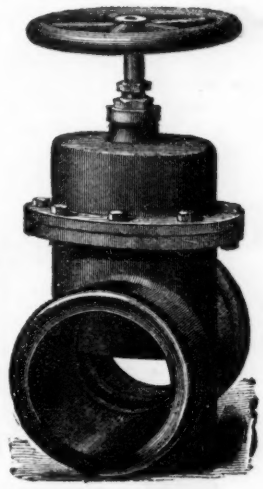
These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is NO LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHE and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.

We refer to the following named Gas-Light Companies among the many that have used these Valves:



BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

CANNELTON COAL COMPANY

Of West Virginia.

Offer to Manufacturers of Gas the pure Cannel Coal from their Colliery at Cannelton, West Virginia. This coal after having been thoroughly tried by the most expert and reliable Engineers, has shown itself to be the most valuable **Enriching agent** produced in this country—a gross ton yielding **10,000** cubic feet of gas, of **64.54** candle power, to purify which, required only two bushels of lime. The yield of coke is **32 bushels** of good quality, quite light, burns freely, making a very hot fire. For further information address

J. TATNALL LEA, Treas.,
P. O. Box 1747. No. 325 Chestnut Street, Phil'a.

PEYTONA CANNEL COAL

From West Virginia.

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power s over **43** candles. Purifies **4,510** feet to the bushel of lime.

S. E. LOW, Secretary,
354 Office, 58 Broadway.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Entrance Examinations June 1 and 2, and Sept 23 and 24. For new Catalogue and late Entrance Examination Papers apply to PROF. SAMUEL KNEELAND,
355-12t Secretary, Boston, Mass.

PROVIDENCE Steam & Gas Pipe Co.,

PROVIDENCE, R. I.,

BUILDERS OF

GAS WORKS

AND

GAS-HOLDERS,

RETORT HOUSE ROOFS,
PURIFIER COVERS,
COKE BARROWS,
WATER TANKS.

Particular attention given to

Enlarging and Rebuilding Gas Works.

PRINCIPAL OFFICE AND MANUFACTORY CORNER PINE AND EDDY STREETS. PROVIDENCE, R. I.

FREDERICK GRINNELL, President, J. C. HARTSHORN, Treas,
F. H. MAYNARD Secretary.

CHICAGO OFFICE, 103 WASHINGTON ST., CHICAGO, ILL.
FARRINGTON & BRANCH, Agents.

RILEY A. BRICK & CO.,

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS,

ALSO,

GAS WORKS AND MACHINERY CASTINGS

OF EVERY DESCRIPTION,

No. 112 Leonard Street, New York.

RILEY A. BRICK. JAS L. ROBERTSON

AMERICAN GAS WORKS CONSTRUCTION AND *Supply Company.*

President—JAMES A. TAYLOR, Columbian Iro Works.

Engineer—A. F. HAVENS, late of Brooklyn Ga Light Co, Patentee of the following inventions:

HOISTING ENGINES,
COAL ELEVATORS,
WIRE-ROPE RAILROAD,
TRAYS FOR LIME OR IRON
RETORT CHARGING AND RAKING MACHINE,
RETORT SETTINGS,
SELF-SEALING LIDS,
AUTOMATIC DIP-PIPE SEAL
SECTIONAL PURIFIERS.

The above Patents are the result of many years experie n and are of great value, enabling any Company to incr the capacity of its Retort and Purifying Apparatus 15 to per cent without change, and at slight cost.

Plans, Specifications, and Details furnished of all Appar tus, and Companies supplied with every thing required in Gas Manufacture, from the greatest to the least, at the lo est market rates.

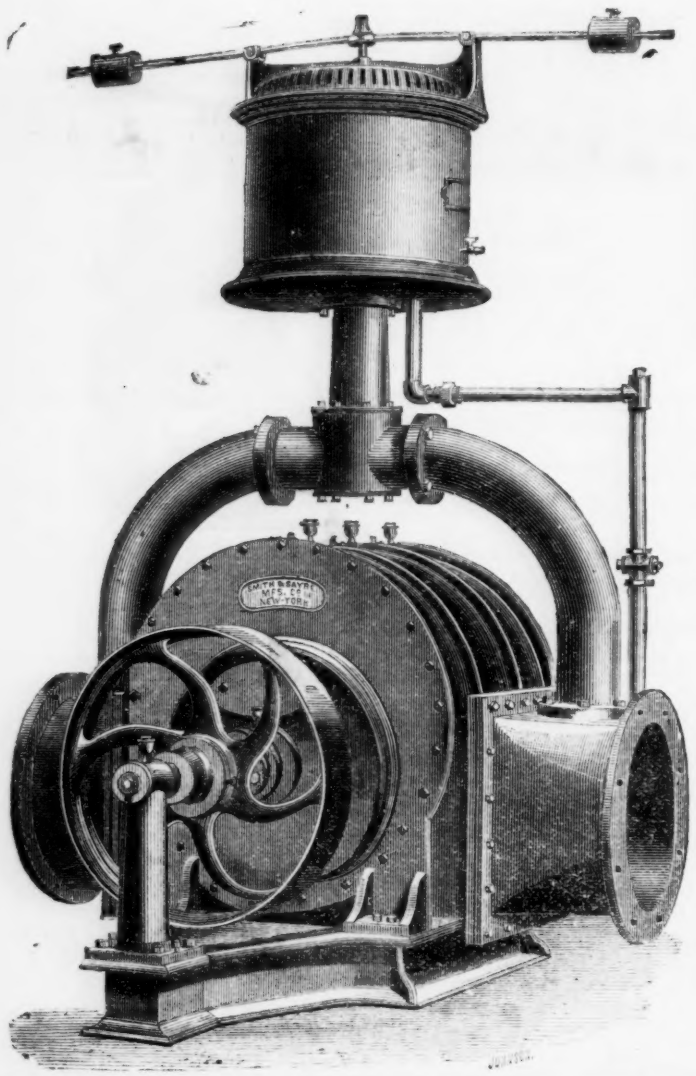
American Gas Works Construction and Supply Company,
No. 34 Dey St., N. Y.

☞ Mr. HAVENS can be consulted on all matters appertaining to Gas and its manufacture, gratis.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

CHARLES W. ISWELL, Secretary. JAMES M. SAYRE, Treasurer. G. G. PORTER, President.

OFFICE, 98 LIBERTY STREET, New York.

AMERICAN

GAS SCREEN MAN'F'G COMPANY.

TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

Testimonials.

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of* pen space in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec, 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3. 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.'
SPRINGFIELD, MASS., Oct. 10, 1871.

Mr. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT.

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PIERCE

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give you my experience.

Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co., Boston, Mass. Gas-Light Co.; East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.; New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas-Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.; San Francisco, Cal., Gas-Light Co.; Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gas-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light Co., and one hundred others.

Address **R. A. POTTER, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass

EDWARD DUFFEE, Agent.

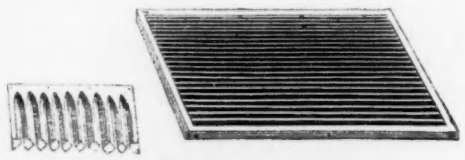
J. L. CHEESMAN.

MANUFACTURER OF

Patent Conically and Diamond Slotted

SOLID WOOD TRAYS.

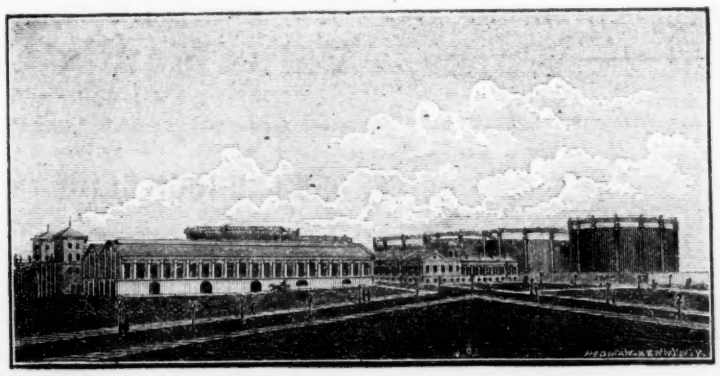
PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



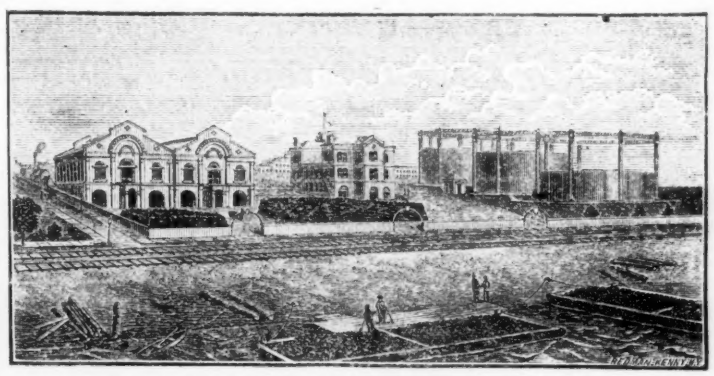
To Gas Companies.

The above Trays will last longer, and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays They are now used in over three hundred Gas Companies the United States, and other places.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York



CINCINNATI GAS WORKS, ERECTED 1871-72-73.—WM. FARMER, Eng.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, Eng'r.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company, St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [342

GAS PURIFICATION.

St. John and Cartwright's
NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime*. Takes out *all the ammonia*. Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to

ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

B. S, BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,

BALTIMORE, MD.

OHIO GAS CANNEL,
From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47½ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

TUTTLE & GIRTY Proprietors,
Cleveland, Ohio.

GENERAL AGENTS.

Geo. Merryweather, 52 William St., (Corner Pine) N. Y. Post Office Box, 5115.

GEO. STACEY. HENRY RANSHAW. WM. STACEY.

GEO. STACEY & CO.,

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS,

AND ALL KINDS OF

Cast and Wrought Iron Work

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.	Baton Rouge, La., Gas Co.
Indianapolis Gas Co.	Saginaw, Mich., Gas Co.
Dayton, O., Gaslight Co.	Oshkosh, Wis., Gas Co.
Covington, Ky., Gas Co.	Peoria, Ill., Gas Co.
Springfield, O., Gas Co.	Quincy, Ill., Gas Co.
Terre Haute, Ind., Gas Co.	Champaign, Ills., Gas Co.
Madison, Ind., Gas Co.	Carlinville, Ill., Gas Co.
Kansas City, Mo., Gas Co.	Bowling Green, Ky., Gas Co
Topeka, Kansas, Gas Co.	Hamilton, Ohio, Gas Co.
Burlington, Iowa, Gas Co.	Vicksburg, Miss., Gas Co.
Nashville, Tenn., Gas Co.	Denver City, Cal., Gas Co.

R. T. Coverdale, Eng'r Cincinnati, and others.

JESSE W STARR & SONS,

Camden Iron Works

Camden, New Jersey,

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varyin from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves

for Purifiers. Station Meters of all sizes.

GAS HOLDERS,

TELESCOPIC AND SINGLE,

With cast iron guide and suspension frames. GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ to 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

Wrought Iron Work.

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE W. STARR. BENJ. A. STARR. BENJ. F. ARCHER

B. E. CHOLLAR,

Gas Engineer,

914 OLIVE STREET, ST. LOUIS, MO.

355 12t

FREEMAN BUTTS,

Of Cleveland, Ohio.

MINER AND SHIPPER OF THE CELEBRATED AND ONLY GENUINE

Sterling Coal,

also dealer in YOUGHIOGHENY, PITTSBURGH, AND AMERICAN CANNEL. Would refer to the following Gas-Light Companies, who have used the HAND PICKED SELECTED COAL:

New York City, Manhattan and New York Companies, Brooklyn, Albany, Troy, West Troy, Rochester, Buffalo, Oswego, Ogdensburgh, Lansingburg, Newburg, Rome, Palmyra, Geneva, Yonkers, Rondout, Kingston, Albion, Brockport, Seneca Falls, Elmira and Lyons, n State or New York; Cleveland, Toledo, Sandusky, Norwalk, Oberlin, Salem and Fremont in Ohio; Detroit, Ann Arbor, Grand Rapids, Kalamazoo, Jackson and Adrian, in Michigan; Toronto, Hamilton, and Coburg, in Canada; Chicago, Ill., and two Companies in Milwaukee, Wisconsin.

Letters in reference to Coal should be addressed to the General Office of FREEMAN BUTTS, Cleveland, Ohio. 354

MONONGAHELA

GAS COAL COMP'Y

Of West Virginia.

OFFICE, 56 EXCHANGE PLACE.
(P. O. Box 432.)
BALTIMORE

Thomas Gemmell, *President.*
A. Robinson, *Vice-President and Treasurer.*
Benjamin Bissell, *Secretary.*

Mines at Wilsonburg, Harrison Co., W. Va. Shipping Port, Baltimore.

This coal yields of Gas 11,200 cubic feet per ton of 2,240 lbs. and has an illuminating Power of 16.30 st. candles. 350-3m

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 52 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.
CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.
SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels of very superior Coke, with little Ash, and scarcely any clinker. 304-1y

EVENS & HOWARD,

Manufacturers of a superior quality of

Fire-Brick, Clay Gas Retorts,

Gas Tile, Drain Pipe, Fine Ground Fire Clay, &c.

916 Market Street, St. Louis, Mo.

318-3m

NATIONAL FOUNDRY

AND PIPE WORKS.

OFFICE AND WORKS—CARROLL, PIKE, SMALLMAN AND WILKINS STREETS,

PITTSBURGH, PA

WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE BRANCHES, CONNECTIONS, T'S, ELBOWS, and all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

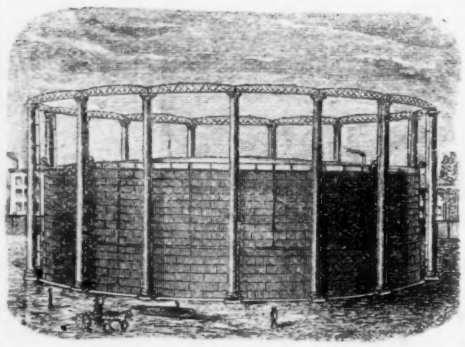
☞ SEND FOR CIRCULAR AND PRICE LIST. ☜

T. F. ROWLAND,

Continental Works,

GREENPOINT, BROOKLYN, N. Y.

ENGINEER, AND MANUFACTURERS OF



GAS-HOLDERS

OF ANY MAGNITUDE,

Condensers, Scrubbers, Purifiers, Retorts, Hydraulic Mains, and all other articles connected with the Manufacture and Distribution of Gas, furnished with despatch. Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

B. S. BENSON & SON,

No. 68 BROADWAY, N. Y., ROOM 7.

MANUFACTURERS OF

CAST IRON GAS & WATER PIPE,

And Fittings for Gas & Water Mains, &c.

All sizes from 3 to 30 inches, cast vertically, in lengths of 12½ feet.

NEW YORK AND CLEVELAND

GAS COAL COM'Y

Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation, on most favorable terms.

General Office—384 Penn Avenue,
PITTSBURGH, PA.

Branch Office—C. & P. RR. Coal Pier,
CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY, Agent
351-1y at Cleveland, Ohio.

THE NEWBURGH

Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.
Company's Office, No. 52 S. Gay Street, Baltimore, Md.
C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.
SINCLAIR & AGNEW, Agents, Alexandria, Va.

This Company offer their very superior Gas Coal at lowest market prices.

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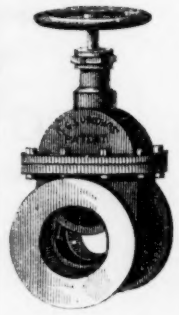

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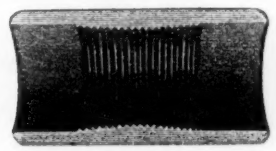

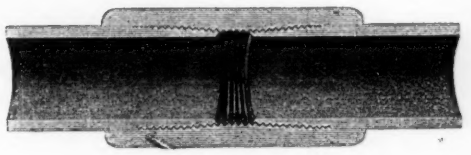

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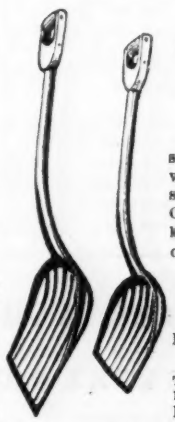

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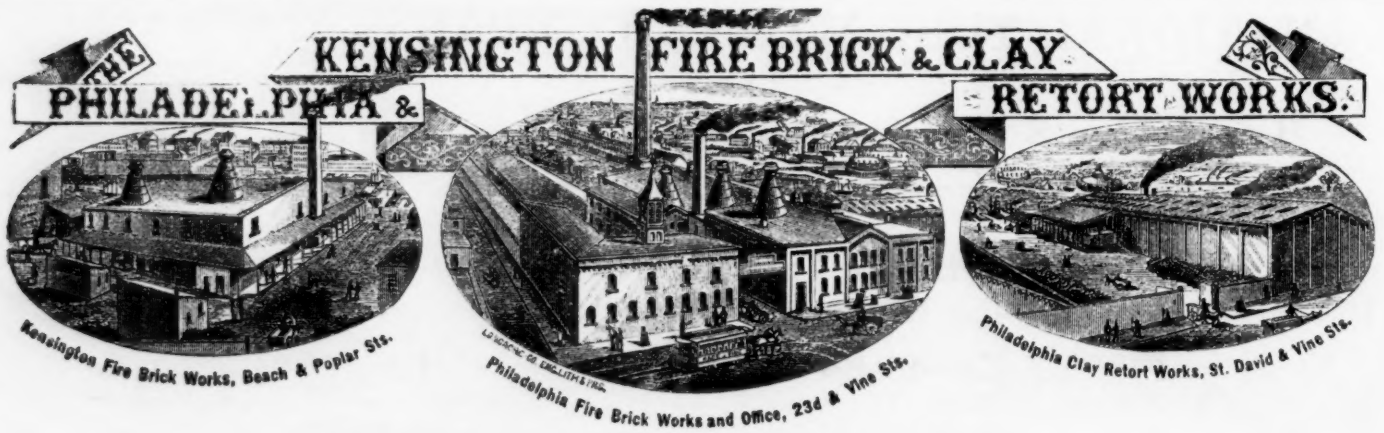
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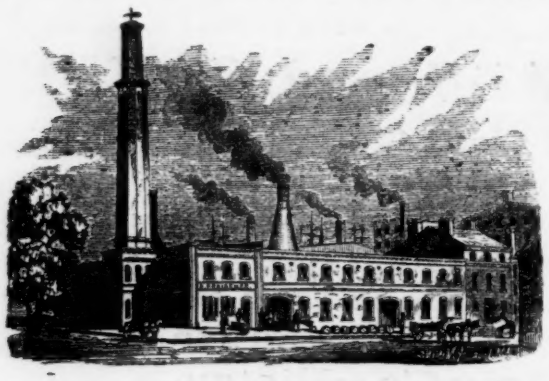

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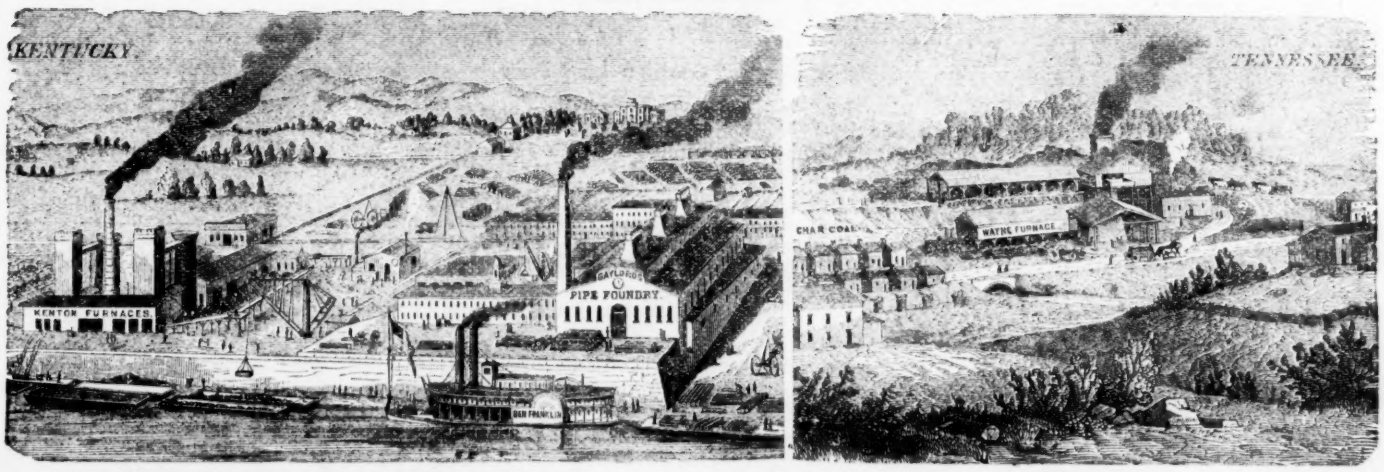

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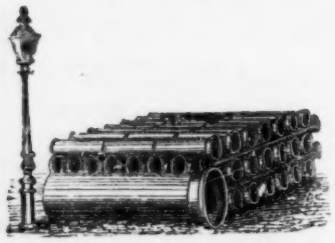

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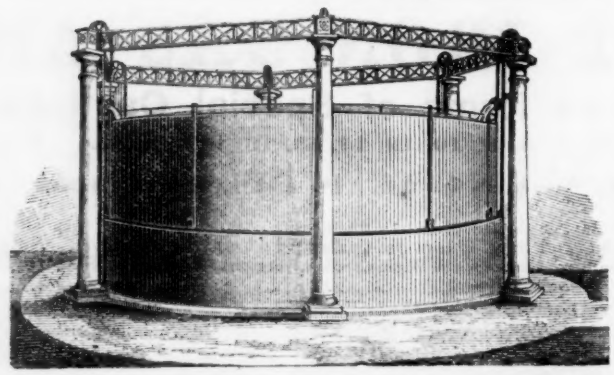

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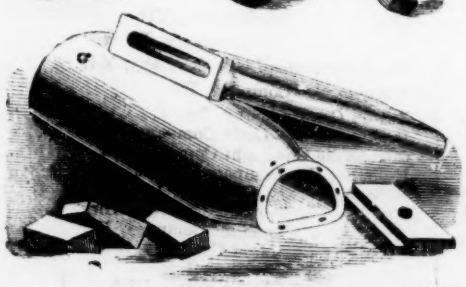

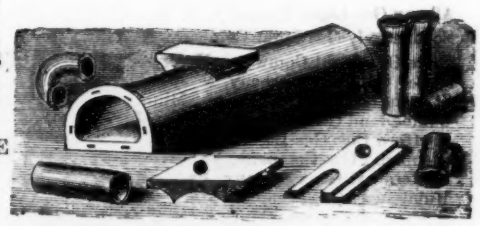

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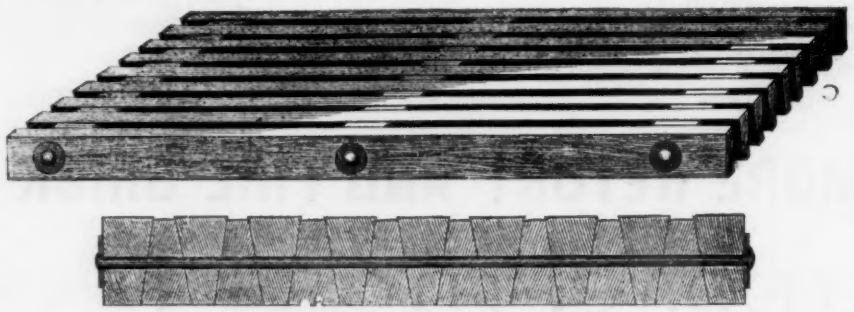

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